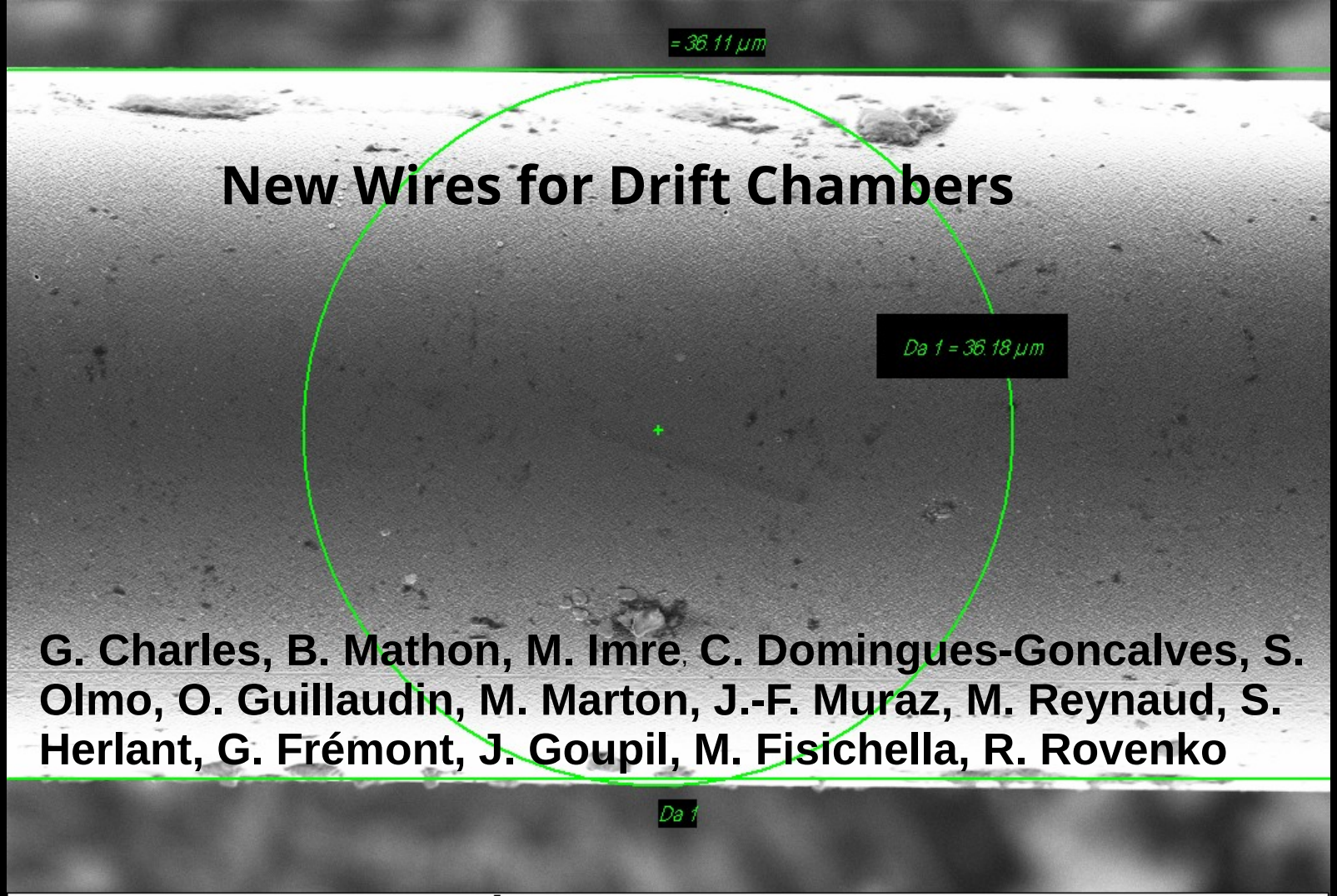


New Wires for Drift Chambers

G. Charles, B. Mathon, M. Imre, C. Domingues-Goncalves, S. Olmo, O. Guillaudin, M. Marton, J.-F. Muraz, M. Reynaud, S. Herlant, G. Frémont, J. Goupil, M. Fisichella, R. Rovenko

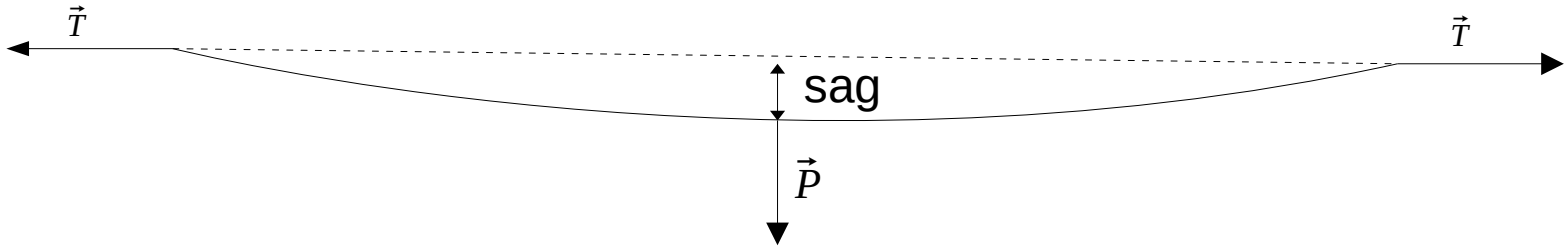
Wire Chambers?

future			
ILC	ILD	TPC	
	SiD	Si	
CLIC	CLIC	Si	
FCC-ee	CLD	Si	
	IDEA	Drift Chamber	
CEPC	Baseline	TPC	Si
	4th	Si + Drift Chamber	
	IDEA	Drift Chamber	
SCTF	BINP	Drift Chamber	
STCF	HIEPA	Drift Chamber	

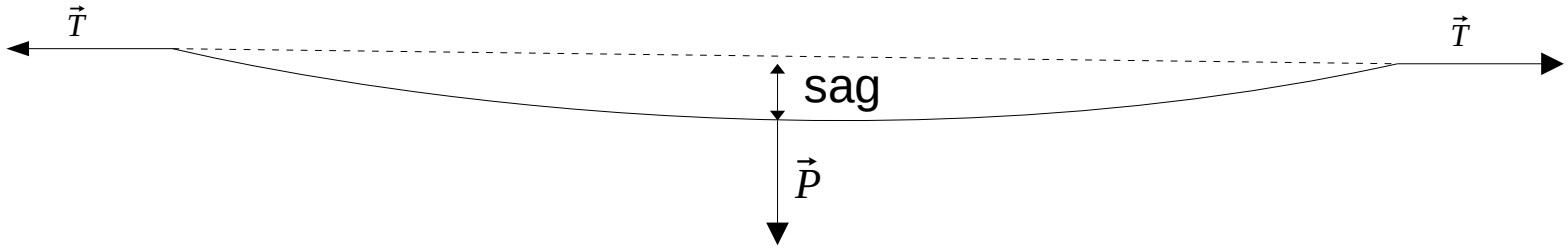
+ FCC-ee ALLEGRO

And that's only the HEP part!

Why New Wires?



Why Lighter Wires?



Lighter wires:
- same sag = lower tension
- lower sag = same tension but better tracking

+ reduced quantity of material

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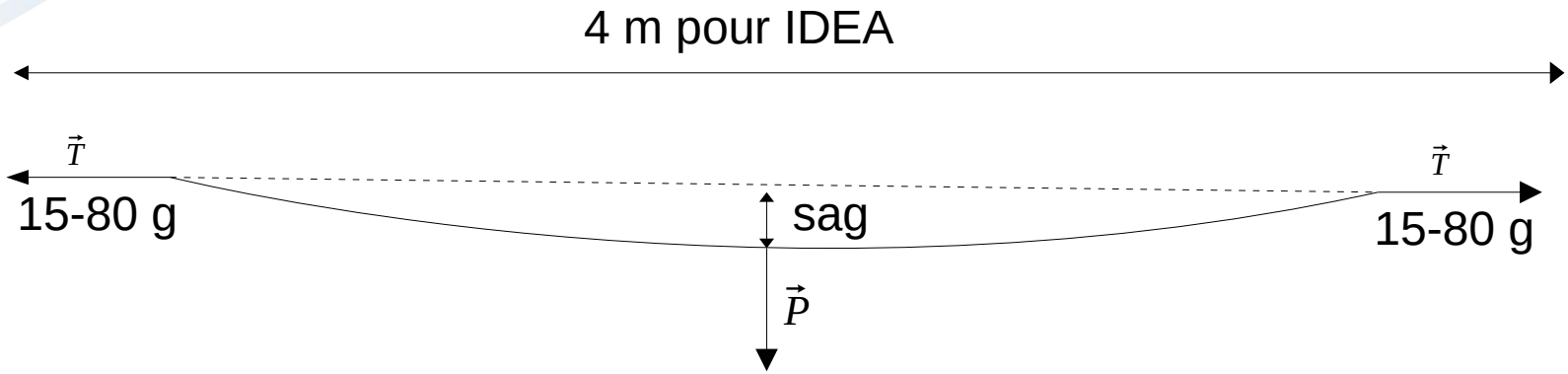

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Standard wires made of gold plated tungsten, diameter between 20-60 µm
Some chambers with aluminum wires (Al5056 precisely)

50g * 100 000 = 5T
IDEA, 344 000 wires, 10T

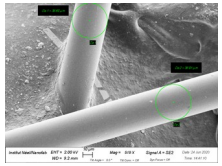
Which lighter wires?

Spec material Inc

Diameter: 34 µm +/- 2.5 µm

Electrical resistivity (measured): 1,67 kΩ/cm

Coating necessary for some applications



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Article: G. Charles et al., *Carbon wire chamber at sub-atmospheric pressure*, NIM A, 2017, vol. 855

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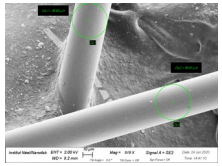

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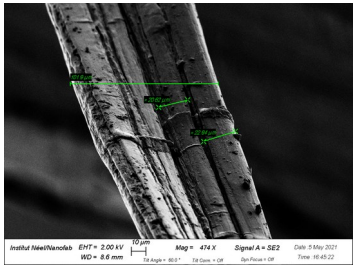
Dexmat

Diameter: 30 µm +/- 5 µm but in fact way more variations

It is ribbon not a wire

Small broken filaments can be seen around the main axis

Extremely strong



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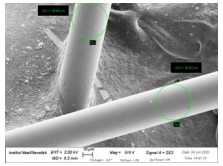

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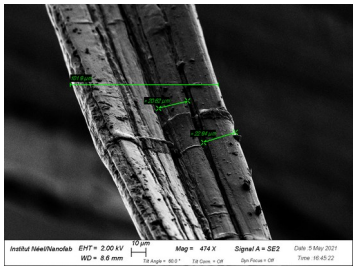

Jacques Allemann + Luma Wire Tech

Many diameters

Piano Wire (carbon based wires)

Risk of corrosion

Must be coated with gold

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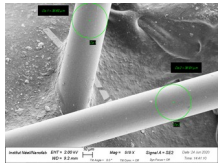

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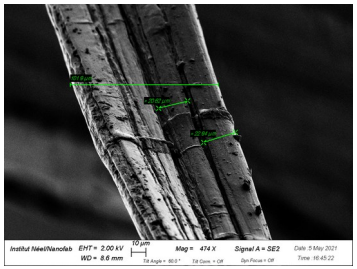

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Jacques Allemann Find a European thin aluminum wire producer

Can we solder the wires?

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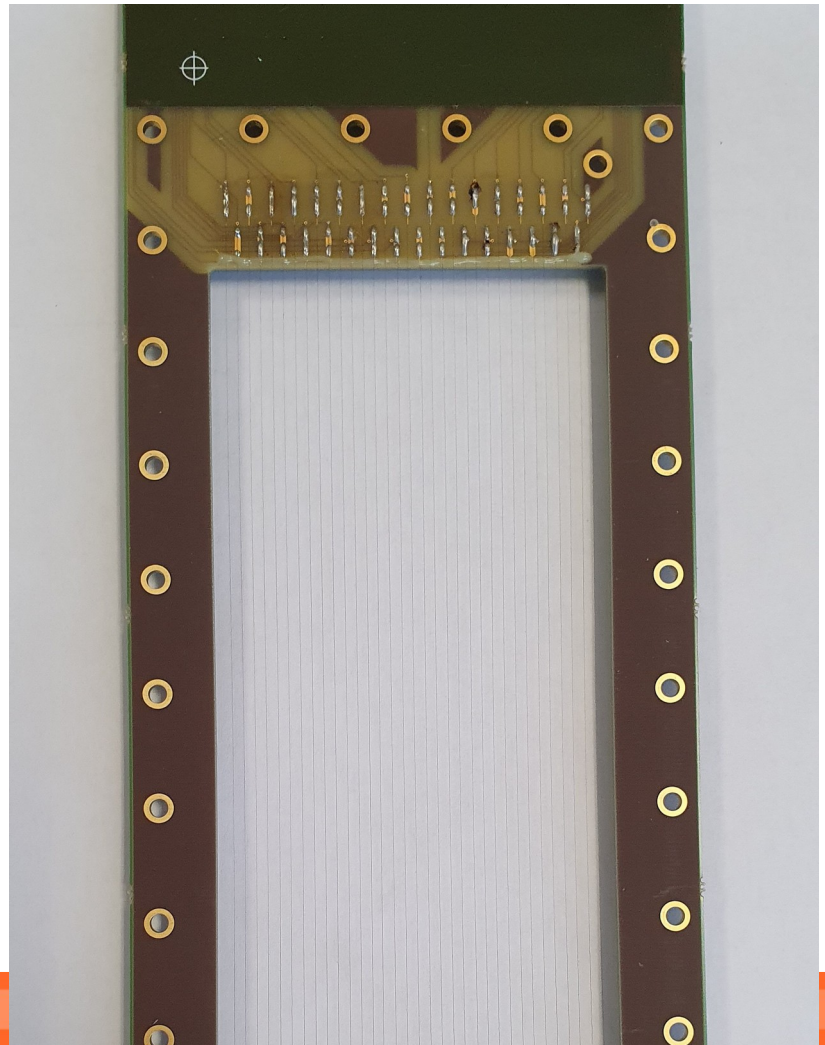
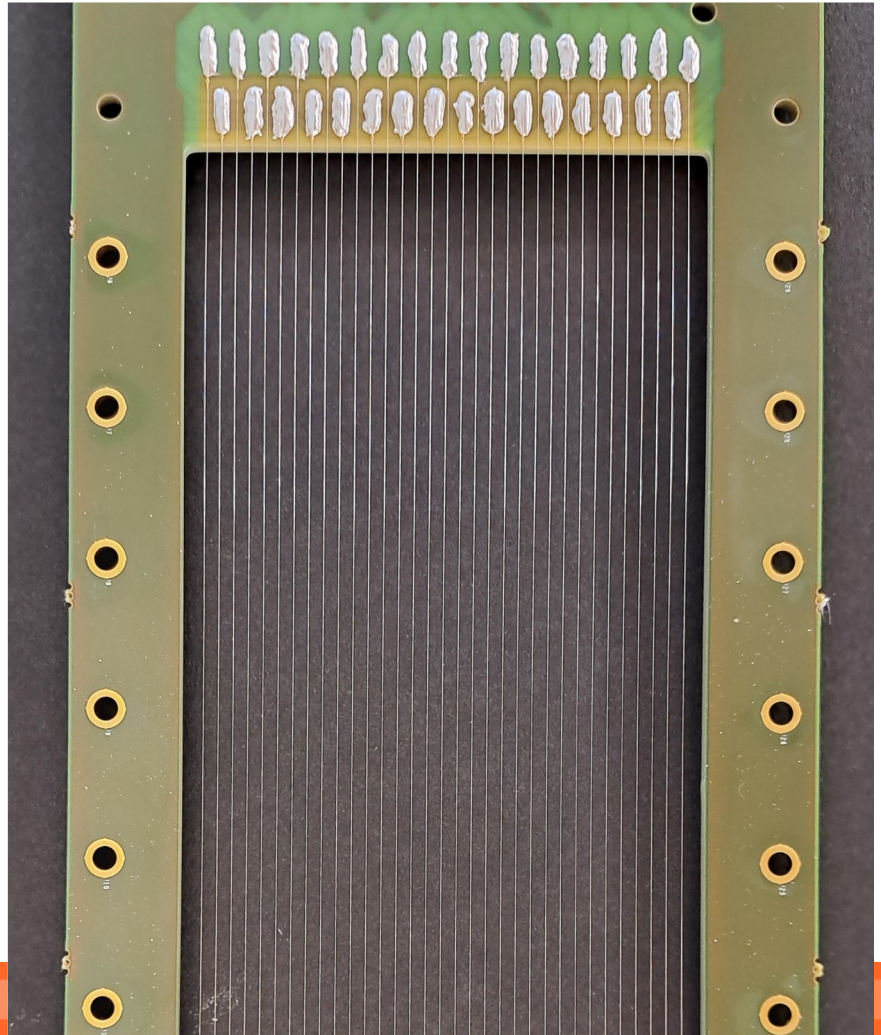


First detector equiped with 100 % carbon monofilament

Standard soldering procedure used

Assembled at IJCLab

Can we glue the wires?



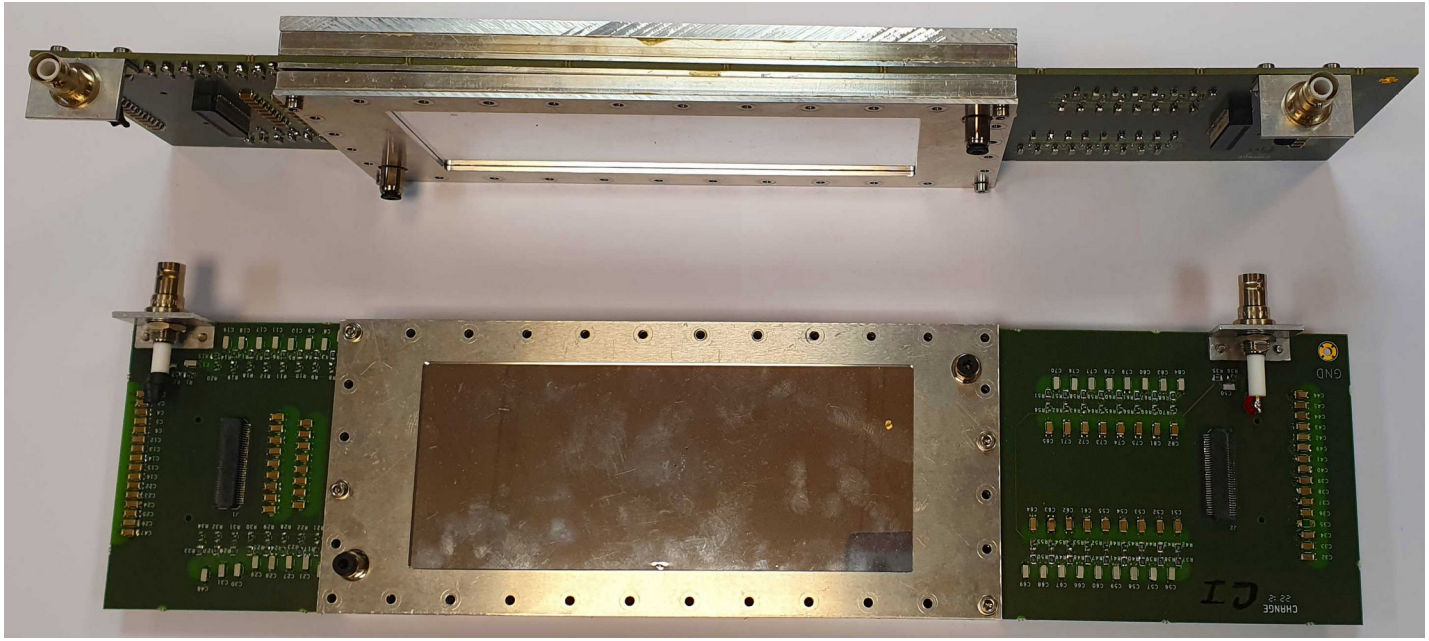
Detector equiped with 100 % 80 µm AlMg5 wires

Standard gluing procedure used

Assembled at LPSC

Testing wires?

Simple detector, 3 mechanics available at GANIL, 3 at IJCLab.
32 chanels read on both side.
Easy to change the PCB to test different types of wire.



Tests with radioactive source not easy

Tests with radioactive source

Tests with a source:
- check background with autotrigger

- then take data with the source but needs opening of the detector

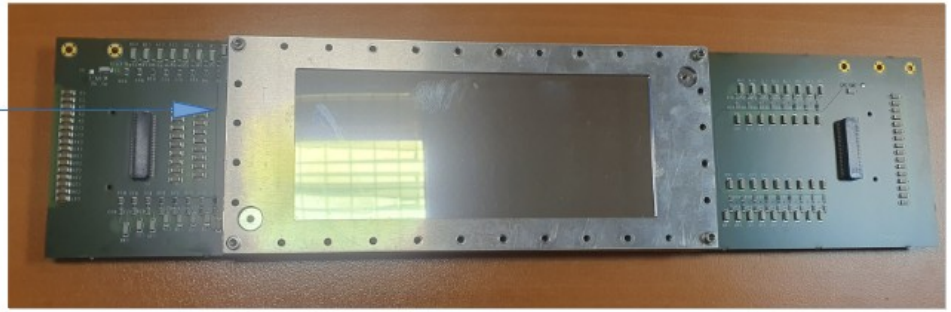
=> New version with improved mechanics and PCB

Mise en place des tests avec les détecteurs CHANGE

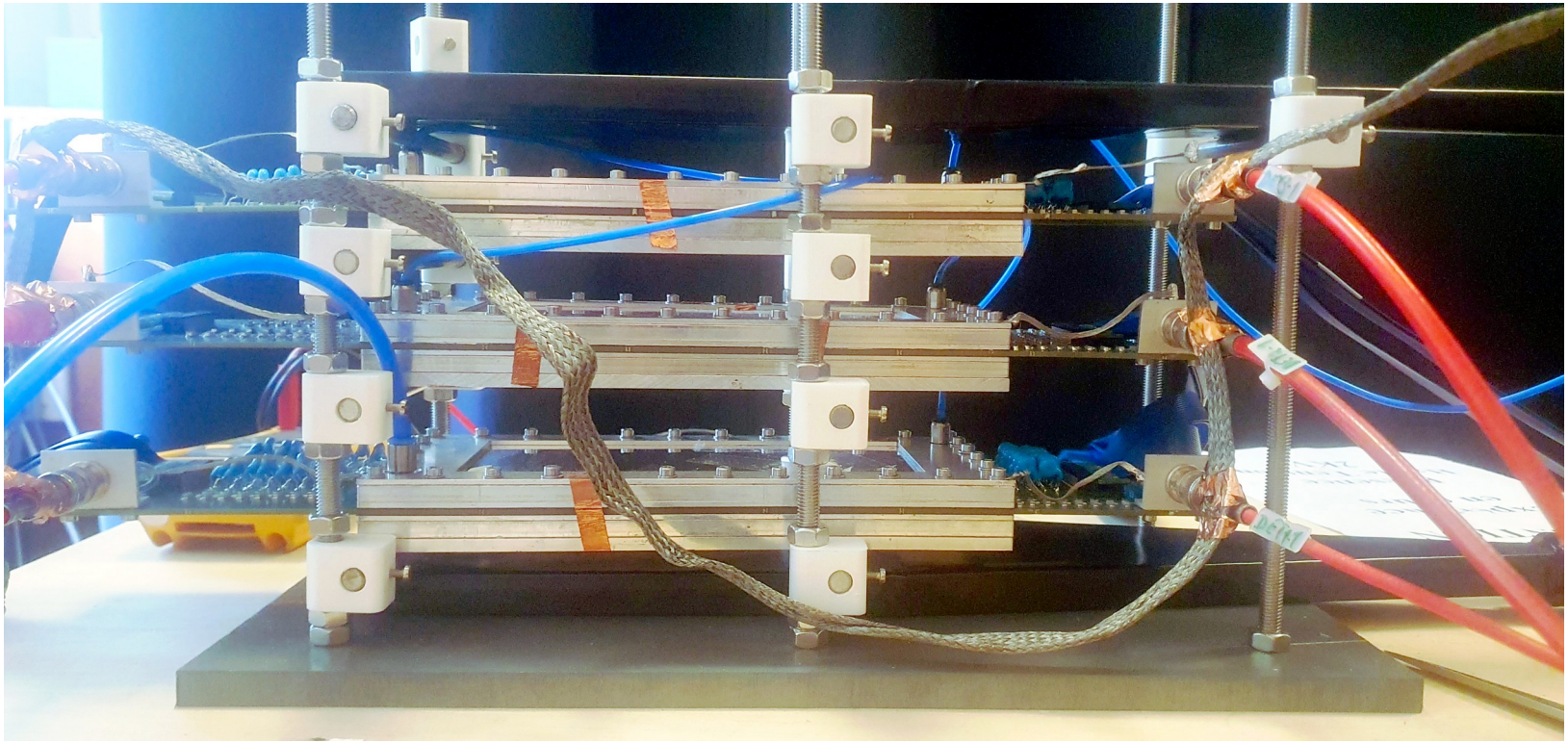
Rédacteur: Gabriel CHARLES

Objet: suite à quelques défauts de conception, ce document résume les points auxquels il faut préter attention lors de tests avec les détecteurs CHANGE

1) Un via qui permet de relier les plans de masse entre eux et une ligne de à la haute tension sont trop proches. Ce via est un rebut de plusieurs modifications du PCB. Le plan de masse est connecté ailleurs aux autres plans. Le via est donc inutile. Il est donc possible de l'enlever en perçant sans toucher la ligne de haute tension. Si la ligne de masse est également coupée, il sera possible de la remplacer par un fil extérieur donc il n'y a pas de risque.
Emplacement du via. Il est indiqué sur la photo ci-dessous.

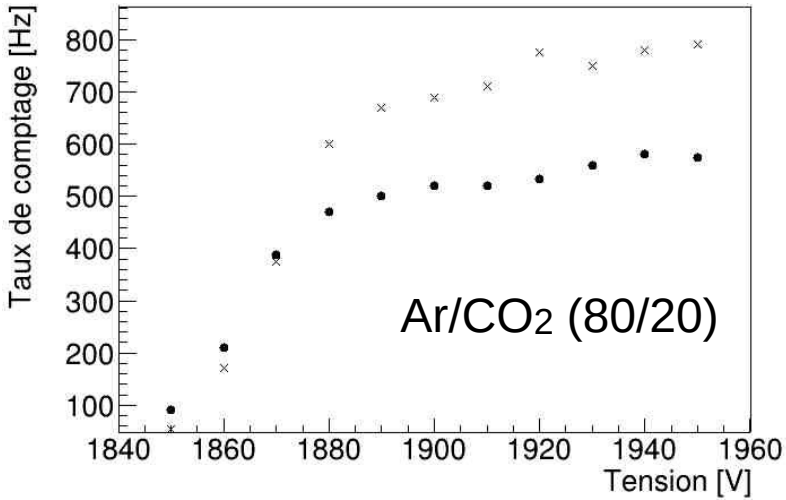


Testing wires?



Results with the new wires?

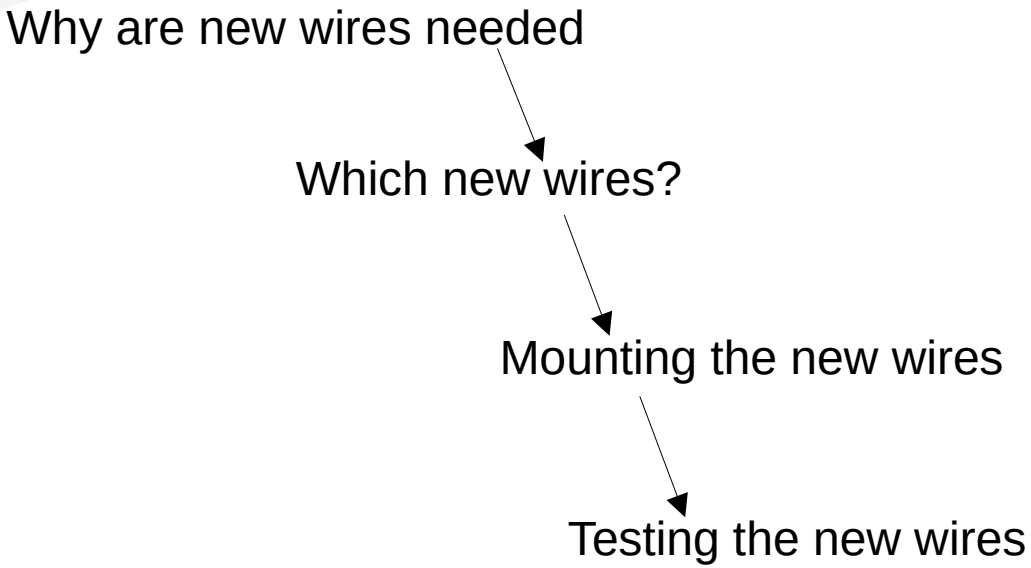
Working point found for all detectors: around 1500V with Ar/CO_2 (90/10)



Carbon monofilament detector reaches higher maximum voltage for similar radius

Cosmic data being analysed

Summary and conclusions



Keep knowledge up-to-date at IN2P3

Create new collaborations with INFN and industrial partners